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# The Impact of Covid-19 Pandemic on the Detection of Tuberculosis in Armenia

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## Abstract

**Background:** One of the vulnerable components of Tuberculosis Care Programs affected by the Covid-19 pandemic was the detection of tuberculosis (TB). Based on this conviction, a study devoted to the impact of the Covid-19 pandemic on the detection and diagnosis of tuberculosis was conducted in Armenia. **Methods:** This observational study has a retrospective descriptive research design based on the comparative calculation of the TB incidence rate for the historical pre-pandemic period (01-Mar-2019 to 29-Feb-2020) and during the Covid-19 pandemic period (01-Mar-2020 to 28-Feb-2021). **Results:** The data evaluation revealed that the number of active TB cases detected during the Covid-19 pandemic was lower by 37.6% compared with the pre-pandemic period (416 vs. 667). The significant reduction of the bacteriologically confirmed cases of pulmonary tuberculosis (28% drop) was most likely related to the decrease in the sputum diagnostic tests, as the number of patients who were tested by sputum microscopy during the pandemic was lower by 43.3% compared with the pre-pandemic period (2329 vs. 4110) and the number of patients tested by sputum GeneXpert test dropped by 23% during the Covid-19 pandemic (2291 vs. 2977). **Conclusion:** The comparative calculation of TB detection rate changes during the Covid-19 pandemic revealed a significant decrease in TB detection compared with the pre-pandemic period. The probable reasons for this decrease were the restrictions on visits to medical centers, limited access to diagnostic services, and undermined screening and contact tracing activities.

## Keywords

Tuberculosis, Covid-19 Pandemic, Detection of Tuberculosis

## 1. Introduction

The Covid-19 pandemic had significant influences on the Tuberculosis Care Programs in many countries all over the world. One of the vulnerable components affected by the Covid-19 pandemic was the detection and diagnosis of tuberculosis. Data collection and reporting systems were also negatively impacted. Significant reductions in notifications of TB cases with 25% - 30% drops were reported in the three high burden countries (India, Indonesia, and the Philippines) between January and June 2020 compared with the analogical six-month period in 2019 [1]. In South Africa, monthly notifications fell by more than 50% between March and June 2020. These reductions in case notifications could lead to a dramatic increase in additional deaths from tuberculosis. According to the "WHO Global Tuberculosis Report 2020", the plausible explanations for impacts on the monthly case notifications include the following: reductions in the number of health facilities offering diagnostic and treatment services for tuberculosis, reallocation of the staff and molecular diagnostic platforms for tuberculosis to the Covid-19 response, disruption of the procurement and transportation of medicines and laboratory consumables, restrictions in movement for people to travel to health facilities, concerns about stigma, similarities in some clinical features of tuberculosis with those of Covid-19 [2] [3] [4] [5]. In light of the above, it was considered topical to study the impact of the Covid-19 pandemic on the detection and diagnosis of tuberculosis in Armenia.

## 2. Methods

### 2.1. Study Design

This observational study has a design of retrospective and descriptive research based on the comparative calculation of the TB incidence rate for the historical pre-pandemic period (01-Mar-2019 to 29-Feb-2020) and during the Covid-19 pandemic period (01-Mar-2020 to 28-Feb-2021).

### 2.2. Study Procedures

The specific variables evaluated in this study were the numbers of the detected new and retreatment cases of pulmonary and extra-pulmonary tuberculosis (PTB and EPTB). The numbers of the sputum microscopy and GeneXpert diagnostic tests were evaluated and compared for the pandemic and historical pre-pandemic periods. The data were collected from the database for TB cases (e-TB manager), TB registers, case reports and database of laboratory test results. The qualitative component of the research was conducted by means of group discussions with TB doctors.

### 2.3. Key Definitions

- Active TB case: a patient suffering from pulmonary or extra-pulmonary tuberculosis in need of anti-TB treatment.

- New TB case: a previously not treated patient suffering from pulmonary or extra-pulmonary tuberculosis.
- Retreatment case: a patient suffering from pulmonary or extra-pulmonary tuberculosis who received anti-TB treatment for one month or longer in the past.
- Bacteriologically confirmed PTB case: a patient with a diagnosis of pulmonary tuberculosis confirmed by sputum bacteriological tests (smear microscopy, GeneXpert, MGIT).
- Bacteriologically not confirmed PTB case: a patient diagnosed as a pulmonary tuberculosis case based on X-ray findings without any bacteriological conformation.
- EPTB case: a patient with a diagnosis of bacteriological conformed or not confirmed extra-pulmonary tuberculosis.

### 2.4. Study Setting

The entire territory of the Republic of Armenia served as a study site. Health facilities notifying and treating TB patients (National Center of Pulmonology and ambulatory TB cabinets) served as field structures for data collection.

## 3. Results

The data evaluation for the Covid-19 pandemic and pre-pandemic periods revealed that the number of active TB cases detected and reported during the Covid-19 pandemic was lower by 37.6% compared with the pre-pandemic period (416 vs. 667). As it can be seen from Table 1, a very similar trend is observed when comparing the difference between the new and retreatment TB cases detected in the both periods (38.7% and 32.4% drop accordingly). The significant reduction of the bacteriologically confirmed cases of pulmonary tuberculosis (28% drop) was most likely related to the decrease of the number of patients

Table 1. The numbers of TB cases detected and reported in Armenia during the Covid-19 pandemic (01-Mar-2020 to 28-Feb-2021) and pre-pandemic periods (01-Mar-2019 to 29-Feb-2020).

| Period/Detection of TB cases (numbers) | Active TB cases | New TB cases | Retreatment cases | PTB cases | Bacteriologically confirmed PTB cases | Bacteriologically not confirmed PTB cases | EPTB cases | TB cases among the population aged 0 - 15 | TB cases among the population aged 15 - 18 |
|---|---|---|---|---|---|---|---|---|---|
| Covid-19 pandemic period (01-MAR-2020 to 28-FEB-2021) | 416 | 341 | 75 | 296 | 226 | 70 | 120 | 22 | 8 |
| Pre-pandemic period (01-MAR-2019 to 29-FEB-2020) | 667 | 556 | 111 | 494 | 314 | 180 | 173 | 38 | 16 |
| Drop of the numbers (%) | 37.6 | 38.7 | 32.4 | 40 | 28 | 61.1 | 30.6 | 42.1 | 50 |

for whom diagnostic sputum tests were done. As it is reflected in Figure 1, the number of patients who were tested by sputum microscopy during the pandemic was lower by 43.3% compared with the pre-pandemic period (2329 vs. 4110). The number of patients tested by sputum GenXpert test dropped by 23% during the Covid-19 pandemic (2291 vs. 2977). The negative impact of the pandemic resulted in the decrease of TB contact tracing. Thus, during the Covid-19 pandemic period the number of examined TB contacts dropped by 44.8% compared with the pre-pandemic period (1146 vs. 2076). There was a dramatic drop (by 85%) of the number of TB cases diagnosed in the result of contact screening (6 cases vs. 40). The comparative calculation of examined contact cases for one diagnosed index case revealed the decrease of this indicator during the Covid-19 pandemic period (Table 2). The significant decrease of detection of bacteriologically not confirmed pulmonary tuberculosis (by 61.1%) was influenced by the

Table 2. Comparative calculation of the examined TB contact cases for one active TB, PTB and bacteriologically confirmed PTB case.

| Period/Number of cases | Number of active TB cases | Number of PTB cases | Number of bacteriologically confirmed PTB cases | Number of TB contacts examined |
|---|---|---|---|---|
| Covid-19 pandemic period (01-MAR-2020 to 28-FEB-2021) | 416 | 296 | 226 | 1146 |
| Pre-pandemic period (01-MAR-2019 to 29-FEB-2020) | 667 | 494 | 314 | 2076 |
| Number of examined contacts for one case during Covid-19 pandemic period (01-MAR-2020 to 28-FEB-2021) | 2.75 | 3.87 | 5.07 | |
| Number of examined contacts for one case during pre-pandemic period (01-MAR-2019 to 29-FEB-2020) | 3.11 | 4.2 | 6.61 | |

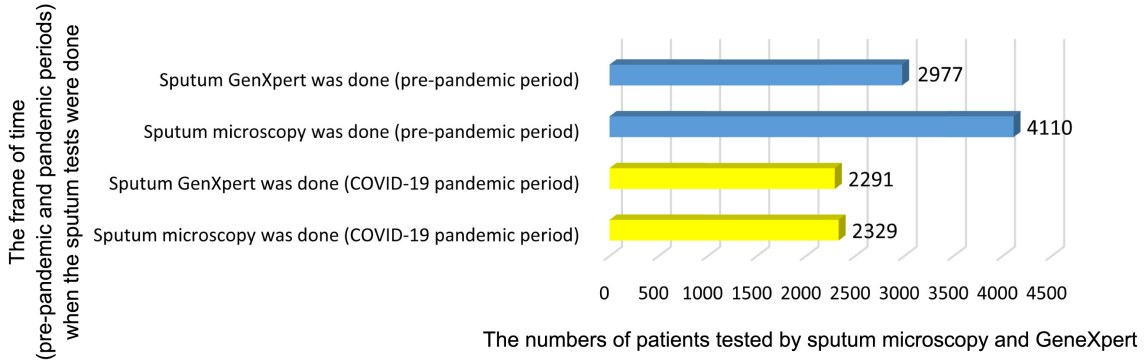


Figure 1. The number of patients for whom diagnostic sputum microscopy and GeneXpert tests were done during the Covid-19 pandemic and pre-pandemic periods.

undermined screening activities, as the most of cases in the initial stages of tuberculosis with negative results of sputum tests (microscopy, GeneXpert, culture) are usually diagnosed during active case finding among TB contacts and TB key populations. The other possible reasons were the limitation of visits to healthcare facilities and limited number of radiological examinations, attribution of TB clinical and radiological findings to Covid-19. The limited access of the diagnostic and screening services influenced the detection of extra-pulmonary tuberculosis and tuberculosis in the population aged 0 - 18. The appropriate figures are presented in Table 1. The diagnosis of tuberculosis in these groups demands comprehensive clinical, instrumental and laboratory examinations, which were not feasible to organize when healthcare resources were engaged in the struggle against the Covid-19 pandemic.

## 4. Discussion

As it can be inferred from the study results, a significant drop of the TB detection rate during the pandemic period was revealed. This decrease was conditioned by the two groups of factors: deterioration of the activities directly related to the TB project and changes influencing the primary healthcare services. The most important deteriorated activities in the framework of TB project were the decrease of number of sputum diagnostic tests, decrease of TB contact tracing and undermined screening activities. The limitation of clinical and instrumental examinations at healthcare facilities represents the main factor related to the shortage of the primary healthcare resources. The aforementioned suggests that the implementation of supporting activities is necessary in case of situations like the Covid-19 pandemic. It would be rational to formulate these activities as action plans and include them in guidelines used for TB care projects.

## 5. Conclusion

The comparative calculation of TB detection rate changes during the Covid-19 pandemic revealed a significant decrease in TB detection compared with the pre-pandemic period. The probable reasons for this decrease were movement restrictions imposed during the quarantine period (self-isolation, restriction of visits to medical facilities, as well as to the National Pulmonary Centre), limited access to diagnostic services and undermined screening and contact tracing activities.

## 6. Recommendations

Based on the data presented in this manuscript, literature review and results of the discussions with TB doctors, the following recommendations were formulated to improve the TB detection activities during pandemics of respiratory infections like Covid-19.

- Implementation of outreach activities to raise awareness of importance of timely diagnosis of tuberculosis among contacts and TB key populations,

- Using a questionnaire based self-screening practice for detection of patients with TB suspicion among the abovementioned populations,
- Engagement of community based organizations in the process of active case finding,
- Organization of active case finding activities among the most substantial TB key populations in Armenia (migrants, internally displaced people, prisoners or detainees, people who use drugs, people with alcohol dependency, smokers, sex workers, homeless people, people with mental or physical disabilities, urban poor and rural poor, people living with HIV, people with diabetes) by the National Tuberculosis Program with engagement of other healthcare facilities and health-social organizations,
- Emphasizing the importance of taking attention to clinical findings of tuberculosis for the healthcare specialists engaged in diagnostic and treatment activities devoted to Covid-19 (meetings, training, etc.).

## Limitations of the Study

The studied period didn't include the entire duration of the Covid-19 pandemic. Although group discussions were conducted with TB doctors, the insight of the topic would have been more comprehensive if group discussions were held with patients and medical staff from primary healthcare facilities.

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## Conflicts of Interest

None declared.

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